What Is Claimed Is:

1. A method for reducing data burst overhead in an Ethernet passive optical network which includes a central node and at least one remote node, wherein downstream data from the central node is broadcast to the remote nodes, and wherein upstream data from each remote node is transmitted to the central node in a unicast manner, the method comprising:

transmitting grant messages to a number of remote nodes, wherein a grant message for a specified remote node assigns a start time and a duration of a transmission timeslot in which the specified remote node may transmit a upstream data burst; and

receiving a number of upstream data bursts, wherein the time gap between two consecutive upstream data bursts is less than the summation of a default laser turn-on time, a default laser turn-off time, an automatic gain control (AGC) period, and a clock and data recovery (CDR) period.

2. The method of claim 1, wherein a preceding upstream data burst's laser turn-off period overlaps with a subsequent data burst's laser turn-on period.

3. The method of claim 2, wherein the non-overlapping portion of the preceding data burst's laser turn-off period is equal to or greater than twice the allowed maximum jitter of the round-trip time between the central node and a remote node; and

wherein the non-overlapping portion of the subsequent data burst's laser turn-on period is equal to or greater than twice the allowed maximum jitter of the round-trip time between the central node and a remote node.

4. The method of claim 2, wherein a grant message specifies a transmission timeslot start time that is earlier than the ending time of an immediately preceding transmission timeslot.

5. The method of claim 1, wherein receiving a number of upstream data bursts involves receiving a number of consecutive data bursts from a remote node, wherein the remote node is allowed to transmit the number of consecutive data bursts without turning off and turning on its laser between two consecutive data bursts.

6. The method of claim 5, further comprising detecting the time gap between two consecutive transmission timeslots assigned to the remote node; and

if the time gap is less than a pre-defined value, allowing the remote node to transmit upstream data during the time gap without turning off and turning on its laser.

7. The method of claim 1, wherein if one or more remote nodes are virtual remote nodes located in a common physical remote node, and if these virtual remote nodes transmit upstream data through a common laser belonging to the common physical remote node, the method further comprises:

allowing the common laser to keep transmitting upstream data without being turned off between consecutive transmission timeslots assigned to one or more virtual remote nodes located in the common physical remote node.

8. The method of claim 7, wherein a grant message contains a laser-turn-on flag and a laser-turn-off flag;

wherein if a grant message's laser-turn-on flag is true, the corresponding remote node turns on its laser at the start time of its assigned transmission timeslot and transmits an AGC bit sequence and a CDR bit sequence before transmitting upstream data;

wherein if a grant message's laser-turn-on flag is false, the corresponding remote node immediately starts transmitting upstream data at the start time of its assigned transmission timeslot without transmitting an AGC bit sequence and a CDR bit sequence;

wherein if a grant message's laser-turn-off flag is true, the corresponding remote node turns off its laser after transmitting upstream data; and

wherein if a grant message's laser-turn-off flag is false, the corresponding remote node continues transmitting data until the end of its assigned transmission timeslot without turning off its laser.

9. The method of claim 7, wherein if one or more remote nodes are virtual remote nodes located in a common physical remote node, and if these virtual remote nodes transmit upstream data through a common laser belonging to the common physical remote node, the method further comprises allowing the common laser to keep transmitting the upstream data bursts without being turned off between consecutive transmission timeslots assigned to one or more virtual remote nodes located in the common physical remote node.

10. The method of claim 1, further comprising receiving an actual laser turn-on time and an actual laser turn-off time from a remote node;

wherein the actual laser turn-on and turn-off times specify the amount of time required by the remote node to turn on and turn off its laser, respectively.

11. The method of claim 10, wherein the actual laser turn-on and turn-off times are transmitted with a registration message from the remote node when the central node initially registers the remote node.

12. The method of claim 10, wherein a grant message assigns a start time and a duration of a transmission timeslot based on the actual laser turn-on and turn-off times of the remote node to which the grant message is destined.

13. An apparatus for reducing data burst overhead in an Ethernet passive optical network, comprising:

at least one remote node; and

a central node configured to,

transmit grant messages to a number of remote nodes, wherein a grant message for a specified remote node assigns a start time and a duration of a transmission timeslot in which the specified remote node may transmit a upstream data burst; and

receive a number of upstream data bursts, wherein the time gap between two consecutive upstream data bursts is less than the summation of a default laser turn-on time, a default laser turn-off time, an AGC period, and a CDR period;

wherein the central node is configured to broadcast downstream data to the remote nodes; and

wherein each remote node is configured to transmit upstream data to the central node in a unicast manner.

14. The apparatus of claim 13, wherein a preceding upstream data burst's laser turn-off period overlaps with a subsequent data burst's laser turn-on period.

15. The apparatus of claim 14, wherein the non-overlapping portion of the preceding data burst's laser turn-off period is equal to or greater than twice the allowed maximum jitter of the round-trip time between the central node and a remote node; and

wherein the non-overlapping portion of the subsequent data burst's laser turn-on period is equal to or greater than twice the allowed maximum jitter of the round-trip time between the central node and a remote node.

16. The apparatus of claim 14, wherein a grant message specifies a transmission timeslot start time that is earlier than the ending time of an immediately preceding transmission timeslot.

17. The apparatus of claim 13, wherein a remote node is configured to transmit a number of consecutive data bursts without turning off and turning on its laser between two consecutive data bursts.

18. The apparatus of claim 17, wherein the remote node is further configured to detect the time gap between two consecutive transmission timeslots assigned to the remote node; and

if the time gap is less than a pre-defined value, allow the remote node to transmit upstream data during the time gap without turning off and turning on its laser.

19. The apparatus of claim 13, wherein if one or more remote nodes are virtual remote nodes located in a common physical remote node, and if these virtual remote nodes transmit upstream data through a common laser belonging to the common physical remote node, the common physical remote node is configured to:

allow the common laser to keep transmitting upstream data without being turned off between consecutive transmission timeslots assigned to one or more virtual remote nodes located in the common physical remote node.

20. The apparatus of claim 19, wherein a grant message contains a laser-turn-on flag and a laser-turn-off flag;

wherein if a grant message's laser-turn-on flag is true, the corresponding remote node is configured to turn on its laser at the start time of its assigned transmission timeslot and transmits an AGC bit sequence and a CDR bit sequence before transmitting upstream data;

wherein if a grant message's laser-turn-on flag is false, the corresponding remote node is configured to start immediately transmitting upstream data at the start time of its assigned transmission timeslot without transmitting an AGC bit sequence and a CDR bit sequence;

wherein if a grant message's laser-turn-off flag is true, the corresponding remote node is configured to turn off its laser after transmitting upstream data; and

wherein if a grant message's laser-turn-off flag is false, the corresponding remote node is configured to continue transmitting data until the end of its assigned transmission timeslot without turning off its laser.

21. The apparatus of claim 19, wherein if one or more remote nodes are virtual remote nodes located in a common physical remote node, and if these virtual remote nodes transmit upstream data through a common laser belonging to the common physical remote node, the physical remote node is further configured to allow the common laser to keep transmitting the upstream data bursts without being turned off between consecutive transmission timeslots assigned to one or more virtual remote nodes located in the common physical remote node.

22. The apparatus of claim 13, wherein the central node is further configured to receive an actual laser turn-on time and an actual laser turn-off time from a remote node; and

wherein the actual laser turn-on and turn-off times specify the amount of time required by the remote node to turn on and turn off its laser, respectively.

23. The apparatus of claim 22, wherein the actual laser turn-on and turn-off times are transmitted with a registration message from the remote node when the central node initially registers the remote node.

24. The apparatus of claim 22, wherein a grant message assigns a start time and a duration of a transmission timeslot based on the actual laser turn-on and turn-off times of the remote node to which the grant message is destined.

25. A computer-readable storage medium storing instructions that when executed by a computer cause the computer to perform a method for reducing data burst overhead in an Ethernet passive optical network which includes a central node and at least one remote node, wherein downstream data

from the central node is broadcast to the remote nodes, and wherein upstream data from each remote node is transmitted to the central node in a unicast manner, the method comprising:

transmitting grant messages to a number of remote nodes, wherein a grant message for a specified remote node assigns a start time and a duration of a transmission timeslot in which the specified remote node may transmit a upstream data burst; and

receiving a number of upstream data bursts, wherein the time gap between two consecutive upstream data bursts is less than the summation of a default laser turn-on time, a default laser turn-off time, an automatic gain control (AGC) period, and a clock and data recovery (CDR) period.

26. The computer-readable storage medium of claim 25, wherein a preceding upstream data burst's laser turn-off period overlaps with a subsequent data burst's laser turn-on period.

27. The computer-readable storage medium of claim 26, wherein the non-overlapping portion of the preceding data burst's laser turn-off period is equal to or greater than twice the allowed maximum jitter of the round-trip time between the central node and a remote node; and

wherein the non-overlapping portion of the subsequent data burst's laser turn-on period is equal to or greater than twice the allowed maximum jitter of the round-trip time between the central node and a remote node.

28. The computer-readable storage medium of claim 26, wherein a grant message specifies a transmission timeslot start time that is earlier than the ending time of an immediately preceding transmission timeslot.

29. The computer-readable storage medium of claim 25, wherein receiving a number of upstream data bursts involves receiving a number of consecutive data bursts from a remote node, wherein the remote node is allowed to transmit the number of consecutive data bursts without turning off and turning on its laser between two consecutive data bursts.

30. The computer-readable storage medium of claim 29, wherein the method further comprises detecting the time gap between two consecutive transmission timeslots assigned to the remote node; and

if the time gap is less than a pre-defined value, allowing the remote node to transmit upstream data during the time gap without turning off and turning on its laser.

31. The computer-readable storage medium of claim 25, wherein if one or more remote nodes are virtual remote nodes located in a common physical remote node, and if these virtual remote nodes transmit upstream data through a common laser belonging to the common physical remote node, the method further comprises:

allowing the common laser to keep transmitting upstream data without being turned off between consecutive transmission timeslots assigned to one or more virtual remote nodes located in the common physical remote node.

32. The computer-readable storage medium of claim 31, wherein a grant message contains a laser-turn-on flag and a laser-turn-off flag;

wherein if a grant message's laser-turn-on flag is true, the corresponding remote node turns on its laser at the start time of its assigned transmission

timeslot and transmits an AGC bit sequence and a CDR bit sequence before transmitting upstream data;

wherein if a grant message's laser-turn-on flag is false, the corresponding remote node immediately starts transmitting upstream data at the start time of its assigned transmission timeslot without transmitting an AGC bit sequence and a CDR bit sequence;

wherein if a grant message's laser-turn-off flag is true, the corresponding remote node turns off its laser after transmitting upstream data; and

wherein if a grant message's laser-turn-off flag is false, the corresponding remote node continues transmitting data until the end of its assigned transmission timeslot without turning off its laser.

33. The computer-readable storage medium of claim 31, wherein if one or more remote nodes are virtual remote nodes located in a common physical remote node, and if these virtual remote nodes transmit upstream data through a common laser belonging to the common physical remote node, the method further comprises allowing the common laser to keep transmitting the upstream data bursts without being turned off between consecutive transmission timeslots assigned to one or more virtual remote nodes located in the common physical remote node.

34. The computer-readable storage medium of claim 25, wherein the method further comprises receiving an actual laser turn-on time and an actual laser turn-off time from a remote node; and

wherein the actual laser turn-on and turn-off times specify the amount of time required by the remote node to turn on and turn off its laser, respectively.

35. The computer-readable storage medium of claim 34, wherein the actual laser turn-on and turn-off times are transmitted with a registration message from the remote node when the central node initially registers the remote node.

36. The computer-readable storage medium of claim 34, wherein a grant message assigns a start time and a duration of a transmission timeslot based on the actual laser turn-on and turn-off times of the remote node to which the grant message is destined.